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A Registry of Containerized Tree Seedling Research in Ontario: 1982 - 1983

J. E. Wood and S. J. Colombo, Compilers

Published under the auspices of the
Canada-Ontario Joint Forestry Research Committee

A REGISTRY OF CONTAINERIZED TREE SEEDLING RESEARCH IN ONTARIO: 1982-1983

Compiled by J.E. WOOD[1] AND S.J. COLOMBO[2]

under the auspices of the

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ABSTRACT

This registry outlines both formal and informal, long-term and short-term studies related to the production and use of containerized tree seedlings for reforestation. Investigators and scientific representatives are listed along with affiliations, and a brief statement of objectives is included for each study. All research was conducted within Ontario in 1982 and 1983.

RÉSUMÉ

Ce document présente un bref exposé des objectifs d'études officielles et officieuses, à long terme et à court terme de la production et de l'emploi des semis en récipients destinés à la création de forêts. Les chercheurs et les agents scientifiques sont énumérés de même que l'établissement pour lequel ils travaillent. Tous ces travaux ont été réalisés en Ontario en 1982 et 1983.

FOREWORD

The province of Ontario is in the midst of a major program of forest renewal. The resultant increase in demand for planting stock is being met principally by the expansion of the containerized tree seedling production program. From 10 million seedlings in 1981, the production of containerized nursery stock will reach 68 million seedlings in 1984, accounting for nearly 50% of total planting stock production.

The change in emphasis from bare-root to containerized planting stock has resulted in a commensurate increase in the need for technical information related to the production and use of containerized tree seedlings for reforestation. To help meet this need, the Container Stock Working Group of the Canada-Ontario Joint Forestry Research Committee (COJFRC), with the cooperation of the Great Lakes Forest Research Centre and the Ontario Tree Improvement and Forest Biomass Institute, has undertaken to produce a biennial registry of current research studies carried out in Ontario on container-related topics.

Because of the diverse audience to which this registry may be of interest, including forest managers, researchers, container seedling growers and administrators, a broad spectrum of studies (both formal and informal, long-term and short-term) is included. The contents of this registry cover research conducted within Ontario in 1982 and 1983, and are divided into three sections: I. Stock production and associated outplantings (41 submissions); II. Comparative outplantings of container and bare-root stock (13 submissions); and III. Equipment development (3 submissions). Each study is identified by investigator, affiliation and, in the case of contract research, scientific representative. A brief outline of the objectives of each study is included. Appendices contain lists of COJFRC Container Stock Working Group members, investigators and scientific representatives, and a subject index.

Although the focus of this registry is on Ontario, the studies described here may be of interest to anyone involved in the production or planting of containerized tree seedings. It is the hope of the Working Group that this registry will identify gaps in current research efforts and thereby help to stimulate new experimentation as well as influence current research.

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Cover photo by J.B. Scarratt

Note: The exclusion of certain manufactured products does not imply rejection nor does the mention of other products imply endorsement by the Canadian Forestry Service.

SECTION I

Stock Production and Associated Outplantings

1) THE STATUS OF BUD DEVELOPMENT IN OVERWINTERED BLACK SPRUCE CONTAINER STOCK IN ONTARIO, 1982-1983

Investigators: S.J. Colombo and K.D. Odlum

Affiliation: Ontario Ministry of Natural Resources, Ontario Tree Improvement and Forest Biomass Institute

Objective: To document the levels of bud development in overwintered black spruce container seedlings at Ontario forest tree nurseries, 1982-1983.

2) DORMANCY INDUCTION OF BLACK SPRUCE SEEDLINGS

Investigator: S.J. Colombo

Affiliation: Ontario Ministry of Natural Resources, Ontario Tree Improvement and Forest Biomass Institute

Objective: To determine the duration of short day treatment required for bud initiation and bud dormancy in actively growing black spruce and jack pine seedlings.

3) MORPHOLOGICAL CHARACTERISTICS DISTINGUISHING WINTER-DAMAGED BLACK SPRUCE CONTAINER SEEDLINGS

Investigator: S.J. Colombo

Affiliation: Ontario Ministry of Natural Resources, Ontario Tree Improvement and Forest Biomass Institute

Objective: Winter-damaged and non-damaged black spruce seedlings were examined to determine whether seedlings susceptible to winter damage in the first year could be distinguished on the basis of shoot morphology.

4) DELAYED BUD INITIATION IN BLACK SPRUCE CONTAINER SEEDLINGS DUE TO ACCIDENTAL DAYLENGTH EXTENSION

Investigator: S.J. Colombo

Affiliation: Ontario Ministry of Natural Resources, Ontario Tree Improvement and Forest Biomass Institute

Objective: To determine whether a gradient in black spruce seedling bud development in a production greenhouse was attributable to a nearby yard light. Light intensity, percentage bud initiation and average number of needle primordia were determined in relation to distance from the light source.

5) SECOND-YEAR SHOOT DEVELOPMENT IN BLACK SPRUCE CONTAINER SEEDLINGS

Investigator: S.J. Colombo

Affiliation: Ontario Ministry of Natural Resources, Ontario Tree Improvement and Forest Biomass Institute

Objective: To document shoot growth attributes of black spruce seedlings in the second year following winter damage, or simulated winter damage by shoot pruning. The relative contributions of predetermined growth (originating from needle primordia in overwintered buds) and of free growth (continued needle production and shoot elongation) to second-year height for shoots arising at different points on the stem have been investigated in a greenhouse study.

6) RATES OF DRYING IN BLACK SPRUCE PAPERPOT SEEDLINGS

Investigator: S.J. Colombo

Affiliation: Ontario Ministry of Natural Resources, Ontario Tree Improvement and Forest Biomass Institute

Objective: To examine the rates at which paperpot plugs containing black spruce seedlings will dry in a controlled environment. The effects of transpiration from seedling shoots and from moss covering the top of the container plugs are examined.

7) THE EFFECT OF WATER TEMPERATURE ON BLACK SPRUCE AND JACK PINE SEED GERMINATION

Investigator: S.J. Colombo

Affiliation: Ontario Ministry of Natural Resources, Ontario Tree Improvement and Forest Biomass Institute

Objective: To determine the effects of air and water temperature on black spruce and jack pine seed germination. The rate and final percentage germination of black spruce and jack pine seeds have been investigated in a factorial test of four air temperatures (15, 20, 25 and 30°C) and four water temperatures (0.5, 6, 12 and 20°C). The effect of water temperature on the temperature of the top 1 cm of the growing media was also monitored.

8) WATER RELATIONS OF BLACK SPRUCE CONTAINER SEEDLINGS DURING THAWING

Investigator: S.J. Colombo

Affiliation: Ontario Ministry of Natural Resources, Ontario Tree Improvement and Forest Biomass Institute

Objective: To observe the water relations (plant moisture stress, transpiration rate, and osmotic potential) of black spruce paperpot seedlings under thawing conditions simulating those which have been observed to result in desiccation damage to overwintering spruce container stock.

9) DROUGHT-RESISTANCE OF BLACK SPRUCE CONTAINER STOCK

Investigator: S.J. Colombo

Affiliation: Ontario Ministry of Natural Resources, Ontario Tree Improvement and Forest Biomass Institute

Objective: To observe the changing drought resistance of black spruce container seedlings during seasonal changes from winter rest to bud swelling, flushing, shoot elongation and budset.

10) WINTER INJURY TO SHOOTS AS IT AFFECTS ROOT ACTIVITY IN BLACK SPRUCE AND JACK PINE CONTAINER SEEDLINGS

Investigators: S.J. Colombo and C. Glerum

Affiliation: Ontario Ministry of Natural Resources, Ontario Tree Improvement and Forest Biomass Institute

Objective: To examine the relationship between winter damage to shoots and root growth capacity of black spruce and jack pine paperpot seedlings.

11) THE USE OF ANTI-TRANSPIRANTS TO REDUCE RATES OF WATER LOSS IN BLACK SPRUCE CONTAINER SEEDLINGS

Investigators: S.J. Colombo and K.D. Odlum

Affiliation: Ontario Ministry of Natural Resources, Ontario Tree Improvement and Forest Biomass Institute

Objective: A number of commercially available anti-transpirants, including Cloudcover®, Plantco, Clearspray, Vapor Gard®, and Folicote, are being tested for efficacy and phytotoxicity at a range of concentrations.

12) WINTER HARDENING IN FIRST-YEAR BLACK SPRUCE AND JACK PINE CONTAINER SEEDLINGS

Investigators: S.J. Colombo*, C. Glerum* and D.P. Webb**

Affiliation: *Ontario Ministry of Natural Resources, Ontario Tree Improvement and Forest Biomass Institute; **Canadian Forestry Service, Great Lakes Forest Research Centre

Objective: To observe a number of factors related to development of winter-hardiness in black spruce and jack pine seedlings. The interrelationships between height growth, bud development, frost hardiness, and mitotic index of the terminal buds of one-year-old seedlings from a number of hardening regimes have been examined. Seedlings are outplanted in their second year after germination to assess effects of each hardening regime on subsequent field performance.

13) IMPROVING OVERWINTERING QUALITY WITH A COLD FRAME

Investigator: B. Shaw (replaced J. deWitt)

Affiliation: Ontario Ministry of Natural Resources, Thunder Bay Forest Station

Objective: To determine the effectiveness of opaque plastic cold frames in reducing overwintering damage to black spruce Spencer-Lemaire stock. Overwintering damage is to be assessed by observing seedlings following outplanting and by counting needle primordia in terminal buds. This study was initiated in the winter of 1983-1984.

14) JACK PINE/BLACK SPRUCE FERTILIZATION TRIAL

Investigators: B. Shaw* (replaced J. deWitt) and M. Ludlow**

Affiliation: *Ontario Ministry of Natural Resources, Thunder Bay Forest Station; **W.R. Grace and Company

Objective: To compare the effect of Peters and Plant Products commercial fertilizers on the greenhouse growth and outplanting performance of jack pine and black spruce Spencer-Lemaire seedlings. Study initiated in 1983 followed by outplantings in 1984.

15) PEAT PILLOW TRIAL

Investigators: B. Shaw* (replaced J. deWitt) and N. Carl**

Affiliation: *Ontario Ministry of Natural Resources, Thunder Bay Forest Station; **Great Lakes Forest Products Limited

Objective: A greenhouse study to determine the feasibility of growing black spruce seedlings in Peat Pillow containers as a stock type for use on shallow soil sites. Study initiated in 1983 followed by outplantings in 1984.

16) IMPROVING OVERWINTERING QUALITY WITH AN ANTI-TRANSPIRANT

Investigator: B. Shaw (replaced J. deWitt)

Affiliation: Ontario Ministry of Natural Resources, Thunder Bay Forest Station

Objective: To reduce overwintering damage to black spruce Spencer-Lemaire seedlings through the application of Cloudcover®, a commercial anti-transpirant. Further tests are to be conducted during the 1984 shipping season as a means of preventing planting stock desiccation.

17) DROUGHT TOLERANCE AND PHYSIOLOGICAL MECHANISMS OF RESISTANCE IN NORTHERN CONIFEROUS SEEDLINGS

Investigator: E.B. Dumbroff

Affiliation: University of Waterloo

Scientific Representatives: K.H. Reese* and D.P. Webb**

Affiliation: *Ontario Ministry of Natural Resources, Midhurst Nursery; **Canadian Forestry Service, Great Lakes Forest Research Centre.

Objective: A basic study to provide information necessary to develop practicable hardening procedures for inducing physiological states most conducive to field survival of outplanted black spruce, white spruce, and jack pine seedlings exposed to drought stress. Several biophysical and biochemical parameters are being used to evaluate seedling potential for adaptation to drought.

18) QUALITY CONTROL PLOTS

Investigators: J.K. Heikurinen and G. van Amelsfoort

Affiliation: Ontario Ministry of Natural Resources, Northeastern Region

Objective: A series of planting trials on a range of sites to determine the extent of correlations between container seedling species, cultural regimes and growth progressions at the Thessalon forest tree nursery and field performance after outplanting in the Ontario Ministry of Natural Resources Northeastern Region. A total of 322 sample plots were established and will be assessed 1, 2, 3, 5, 10, 15 and 20 years after planting for seedling survival and growth. Trials established from 1978 to 1983.

19) GROWING MEDIA EVALUATION FOR GERMINATION AND EARLY GROWTH OF CONIFEROUS SEEDLINGS IN AERIAL DARTS

Investigators: G.P. Lumis and T.L. Lennox

Affiliation: University of Guelph

Scientific Representative: J.B. Scarratt

Affiliation: Canadian Forestry Service, Great Lakes Forest Research Centre

Objective: To identify or develop a growing medium for use in aerial darts that will satisfy the moisture requirements for the germination and early growth of coniferous seedlings on cut-over forest sites in northern Ontario. Study initiated in 1983.

20) THE EFFECTS OF IRRIGATION AND NUTRIENT PRECONDITIONING ON THE DROUGHT RESISTANCE OF 16-WEEK-OLD DOUGLAS-FIR AND JACK PINE CONTAINER SEEDLINGS

Investigators: K.M. McClain* and D.P. Lavender**

Affiliation: *Ontario Ministry of Natural Resources, Ontario Tree Improvement and Forest Biomass Institute; **Oregon State University

Objective: To study both the mechanisms controlling and means of increasing drought resistance in Douglas-fir and jack pine container seedlings in a three-part investigation with the following purpose: 1) to ascertain the basis for the effect of altered drought resistance of preconditioned seedlings in relation to the components of total plant water potential and cellular alterations; 2) to evaluate the rate and pattern of transpiration in relation to changes in stomatal conductance and components of plant water potential of preconditioned seedlings during a period of imposed drought; and 3) to determine the effect of irrigation and nutrient supply (KCl) amendments on the ability of 16-week-old Douglas-fir and jack pine container seedlings to survive drought in a greenhouse. Studies will be conducted both in a greenhouse and under semi-controlled field conditions.

21) GROWING MEDIA TESTS WITH PINES AND SPRUCES

Investigator: B.J. Phillion

Affiliation: Ontario Ministry of Natural Resources, Bill Bunting Tree Improvement Centre

Objective: A number of commercial and "home-mixed" growing media have been tested with pines and spruces during the past three years. Studies are being continued to find good media that will maintain their physical and chemical properties over a period of two to three years.

22) FERTILIZER AND NUTRIENT TESTS WITH PINES AND SPRUCES

Investigator: B.J. Phillion

Affiliation: Ontario Ministry of Natural Resources, Bill Bunting Tree Improvement Centre

Objective: New forestry fertilizer formulations are being tested in combination with acetic acid. Potassium and iron supplements to fertilizer solutions are also being tested.

23) USE OF THIRAM TO CONTROL LIVERWORTS

Investigator: B.J. Phillion

Affiliation: Ontario Ministry of Natural Resources, Bill Bunting Tree Improvement Centre

Objective: To determine the toxic effects on coniferous growing stock of Thiram used to control liverworts.

24) pH CONTROL OF GREENHOUSE IRRIGATION WATER

Investigator: B.J. Phillion

Affiliation: Ontario Ministry of Natural Resources, Bill Bunting Tree Improvement Centre

Objective: To conduct a series of tests with acetic, nitric, phosphoric, and sulfuric acids to lower the pH of the irrigation water at Orono from 8.2 to 5.5 without creating nutrient imbalances.

25) USE OF MYCORRHIZAE TO ROOT AND GROW SEEDLINGS

Investigator: B.J. Phillion

Affiliation: Ontario Ministry of Natural Resources, Bill Bunting Tree Improvement Centre

Objective: To root cuttings and grow seedlings of black spruce and Scots pine by using *Pisolithus tinctorius*.

26) DORMANCY INDUCTION AND PREVENTION WITH SPRUCES

Investigator: B.J. Phillion

Affiliation: Ontario Ministry of Natural Resources, Bill Bunting Tree Improvement Centre

Objective: A number of tests have been carried out during the past three years to induce and prevent dormancy in spruces.

27) TESTS WITH LIGHT TO MAXIMIZE GROWTH

Investigator: B.J. Phillion

Affiliation: Ontario Ministry of Natural Resources, Bill Bunting Tree Improvement Centre

Objective: To grow a number of coniferous species at a range of light intensities (up to 22000 lx) under high pressure sodium lamps.

28) USE OF SOIL-WET AND AQUA-GRO WETTING AGENTS

Investigator: B.J. Phillion

Affiliation: Ontario Ministry of Natural Resources, Bill Bunting Tree Improvement Centre

Objective: To test the germination and growth of coniferous seedlings, and rooting of coniferous cuttings, in media wetted with Soil-wet and Aqua-gro.

29) FERTILIZER TRIALS

Investigator: J.B. Scarratt

Affiliation: Canadian Forestry Service, Great Lakes Forest Research Centre

Objective: A continuing series of greenhouse experiments to refine nutrient regimes for the production of containerized planting stock in soilless media. Experiments in 1983 compared growth rates of jack pine with various commercial fertilizer formulations including W.R. Grace and Plant Products special forestry formulations, and locally blended fertilizers, at different rates of application.

30) CONTAINER COMPARISON EXPERIMENTS

Investigator: J.B. Scarratt

Affiliation: Canadian Forestry Service, Great Lakes Forest Research Centre

Objective: A continuing series of greenhouse and field experiments to evaluate the potential biological and operational value of new container types coming onto the market. Field experiments to evaluate seedling growth response and rooting habit are established every two to three years, as new containers are accumulated. Although the container types included vary from planting to planting, continuity is provided by the inclusion of FH 408 paperpots in all comparisons. Containers used in past outplantings include: Japanese paperpot (various sizes), "Ontario" tube, Spencer-Lemaire, Can-Am multipot, the Walters bullet, peat pots, peat sticks, Peat Pillows, Enso, Panth, Combicell, ITW Hi-cone, and Prince tar paper. Emphasis is on black spruce and white spruce, although some plantings include jack pine.

31) CONTAINER STOCK SPECIFICATIONS

Investigator: J.B. Scarratt

Affiliation: Canadian Forestry Service, Great Lakes Forest Research Centre

Objective: A series of field studies to develop preliminary prescriptions (seedling morphological specifications and container size) and associated growing regimes for containerized planting stock to be used in northern Ontario. The objectives are: 1) to optimize seedling size specifications for sites currently being planted to container stock; 2) to extend the effective use of container stock to a wider range of site conditions. Emphasis is on black spruce, white spruce, and jack pine, and the performance of up to nine grades (stock size x container size) of container stock is compared with that of current grades of bare-root stock on a range of site conditions. Findings provide input to Study No. 54 (Silvicultural Prescriptions for Container Planting). Study initiated in 1978 with subsequent outplantings from 1979 to 1982.

32) OVERWINTERING OF CONTAINER STOCK

Investigator: J.B. Scarratt

Affiliation: Canadian Forestry Service, Great Lakes Forest Research Centre

Objective: A series of outdoor studies to quantify air and rooting medium temperatures in containerized seedlings being overwintered under various storage conditions (open storage, shelters, shades, etc.) with and without tray elevation on growing racks. Seedling survival and root growth are usually monitored to determine adverse effects of overwinter storage under specific conditions.

33) GROWING MEDIA COMPARISONS

Investigator: J.B. Scarratt

Affiliation: Canadian Forestry Service, Great Lakes Forest Research Centre

Objective: A greenhouse study to compare the growth of black spruce and jack pine seedlings in commercial soilless growing media. Principal comparisons are among commercial peat-lite formulations, commercial mixtures based on composted bark, and locally blended mixtures.

34) AMENDMENT OF GROWING MEDIA WITH HYDROPHILIC POLYMERS

Investigators: J.B. Scarratt and C. Gutierrez

Affiliation: Canadian Forestry Service, Great Lakes Forest Research Centre

Objective: A greenhouse study to investigate the feasibility of amending soilless growing media with hydrophilic polymers in order to: 1) study the effects of such polymers on germination and seedling growth in the greenhouse; 2) determine their effect upon soil moisture retention and availability; 3) evaluate benefits for outplanting on arid sites; and 4) optimize amendment rates. Species being used for testing are black spruce and jack pine. Study initiated in 1983.

35) EVALUATION OF THE PRODUCTION AND OUTPLANTING PERFORMANCE OF BLACK SPRUCE AND JACK PINE CONTAINER STOCK GROWN UNDER THE PRINCIPAL SYSTEMS IN CANADA

Investigator: D.C. Sutherland

Affiliation: Lakehead University

Objective: A greenhouse study to compare and contrast the effects of the four principal seedling container types and three main fertilization systems in current use in Canada on the growth of black spruce and jack pine seedlings. Seedlings produced will be outplanted to evaluate the effects of container type and fertilization system on subsequent field performance. Study initiated in 1982.

36) *PICEA MARIANA* SEEDLING GROWTH IN RELATION TO CONTAINER SOIL VOLUME AND DIAMETER-DEPTH CONFIGURATIONS

Investigator: D.C. Sutherland

Affiliation: Lakehead University

Objective: To evaluate the growth of black spruce seedlings in containers of four soil volumes and three diameter-depth configurations. Growth will be studied for 16 weeks in the greenhouse and for one growing season in the field. Study initiated in 1982.

37) A COMPARISON OF THE MORPHOLOGICAL QUALITY OF JACK PINE IN RELATION TO FERTILIZER REGIME IN ONTARIO-CIGARETTE AND SPENCER-LEMAIRE CONTAINERS

Investigator: D.C. Sutherland

Affiliation: Lakehead University

Objective: A greenhouse study to compare the growth of jack pine seedlings in Ontario-Cigarette and Spencer-Lemaire containers under three fertilizer regimes. Variations in nutrient uptake will be determined by foliar analysis. Study initiated in 1981.

38) EVALUATING GROWING MEDIA FOR CONTAINER TREE SEEDLING PRODUCTION

Investigator: V.R. Timmer

Affiliation: University of Toronto

Scientific Representative: R. Reffle (replaced K.H. Reese)

Affiliation: Ontario Ministry of Natural Resources, Forest Resources Group

Objective: A greenhouse study to evaluate various mixes of growing media for rearing red pine and black spruce. Stock was grown in pots under standard cultural procedures comparing nine different soil mixes. Five of the mixes were those being used operationally at Ontario Ministry of Natural Resources nurseries, three were available as commercially prepared mixes, and one was a peat-vermiculite mix used at the University of Toronto. Study initiated in 1981.

39) CALIBRATING SOIL TESTS FOR CONTAINER GROWING MEDIA

Investigator: V.R. Timmer

Affiliation: University of Toronto

Scientific Representative: R. Reffle (replaced K.H. Reese)

Affiliation: Ontario Ministry of Natural Resources, Forest Resources Group

Objective: To calibrate a test procedure for monitoring the nutrient status of container growing media. Red pine seedlings were grown for 15 weeks over a range of nutrient regimes. The test was based on a saturated aqueous extract of the growing medium, obtained by suction displacement. Water extractable nutrients of the growing medium were related to yield and nutrient uptake of the seedlings. Ranges of nutrient levels associated with maximum dry matter production were selected as provisional values for optimum growth of containerized red pine seedlings.

40) CONTAINER PAPER TYPE AND SEEDLING GROWTH

Investigator: V.R. Timmer

Affiliation: University of Toronto

Scientific Representative: R. Reffle (replaced K.H. Reese)

Affiliation: Ontario Ministry of Natural Resources, Forest Resources Group

Objective: To assess the effect of paper containers on seedling growth. Black spruce and jack pine seedlings were grown under standard conditions in three grades of size 308 Japanese paperpots: 1) the FH grade of Japanese origin, 2) the VH grade of Japanese origin, and 3) the FH grade of Finnish origin. Study initiated in 1982.

41) DORMANCY INDUCTION AND BUD SET IN *PICEA* CONTAINER STOCK

Investigator: D.P. Webb

Affiliation: Canadian Forestry Service, Great Lakes Forest Research Centre

Objective: A series of growth chamber trials designed to examine the effects of various environmental parameters on bud set and dormancy induction. Emphasis has been placed on defining critical daylengths for bud set in selected Ontario seed sources and on determining the effects of height growth. The influence of herbicide applications during bud development has been examined in relation to endogenous levels and bud abnormalities.

SECTION II

Comparative Outplantings of Container and Bare-root Stock

42) DEVELOPMENT OF WEED CONTROL PRESCRIPTIONS ON FERTILE PLANTING CHANCES IN NORTHERN ONTARIO

Investigators: R.A. Campbell*, A. Lehela*, and J.E. Wood**

Affiliation: *Ontario Ministry of Natural Resources, Pest Control Section; **Canadian Forestry Service, Great Lakes Forest Research Centre

Objective: Field studies to determine the efficacy of, and crop tolerance to, selected herbicides applied at various rates. Experimental plots are planted with jack pine and black spruce paperpot and bare-root trees in the year before, the year of, and year following herbicide application. Herbicides tested in 1982-1983 included hexazinone and glyphosate.

43) SITE AND STOCK TYPE COMPARISONS OF CONIFEROUS SPECIES

Investigators: C. Glerum and J.M. Paterson

Affiliation: Ontario Ministry of Natural Resources, Ontario Tree Improvement and Forest Biomass Institute

Objective: To compare the performance of bare-root and container-grown jack pine and black spruce after outplanting in 1979 on a dry site and a fresh site in the Ontario Ministry of Natural Resources Wawa District. Overwintered and current-year jack pine container stock, and overwintered black spruce container stock were used.

44) A COMPARISON OF FIELD PERFORMANCE OF BARE-ROOT AND PAPERPOT BLACK SPRUCE SEEDLINGS

Investigators: R.E. Hutchison and G.D. Racey

Affiliation: Ontario Ministry of Natural Resources, Ontario Tree Improvement and Forest Biomass Institute

Objective: An outplanting study to compare bare-root with FH 308 black spruce paperpot stock. All stock was fresh lifted and planted on four dates in 1979 in the Ontario Ministry of Natural Resources Kirkland Lake District. Two age classes of bare-root stock were compared with FH 308 overwintered paperpot stock sown on four dates in 1979.

45) EXTENDING THE PLANTING SEASON WITH BARE-ROOT, CONTAINER AND JUVENILE CUTTING STOCK TYPES

Investigators: R.E. Hutchison and G.D. Racey

Affiliation: Ontario Ministry of Natural Resources, Ontario Tree Improvement and Forest Biomass Institute

Objective: A series of black spruce outplantings to study: 1) planting season extension; and 2) the relative merits of bare-root stock, seeded paperpots, and juvenile cuttings in paperpots. Three age classes of bare-root stock were compared with overwintered FH 308 paperpots (seeded on two dates), FH 408 paperpots (seeded on one date) and juvenile cuttings rooted in FH 308 paperpots in 1979. All stock was planted on four dates from 14 May to 30 July, 1980 in the Ontario Ministry of Natural Resources Kirkland Lake District.

46) COMPARISON OF FIELD PERFORMANCE OF BARE-ROOT AND PAPERPOT JACK PINE SEEDLINGS

Investigators: R.E. Hutchison and G.D. Racey

Affiliation: Ontario Ministry of Natural Resources, Ontario Tree Improvement and Forest Biomass Institute

Objective: A comparative study of jack pine bare-root and container stock planted on three dates in 1981 in the Ontario Ministry of Natural Resources Kirkland Lake District. Two age classes of bare-root nursery stock were compared with overwintered paperpots seeded on four dates.

47) COMPARATIVE FIELD PERFORMANCE OF THREE AGE CLASSES OF BLACK SPRUCE BARE-ROOT STOCK AND CONTAINER-GROWN SEEDLINGS

Investigators: R.E. Hutchison and G.D. Racey

Affiliation: Ontario Ministry of Natural Resources, Ontario Tree Improvement and Forest Biomass Institute

Objective: A comparison of black spruce bare-root and container stock, planted on five dates in 1981 in the Ontario Ministry of Natural Resources Kirkland Lake District. Three age classes of bare-root nursery stock were compared with FH 308 paperpots seeded on one date and FH 408 paperpots seeded on three dates in 1980.

48) OUTPLANTING TRIAL--MINDEN DISTRICT

Investigator: P.H. Hynard

Affiliation: Ontario Ministry of Natural Resources, Minden District

Objective: To compare field performance of white pine seedlings grown in multipot containers when outplanted within shelterwood cut stands of natural white pine treated with either mechanical or chemical site preparation. Planting established in 1983.

49) B.C. BULLETS--1982

Investigator: D. Renwick

Affiliation: Ontario Ministry of Natural Resources, Parry Sound District

Objective: To evaluate the comparative field performance of white pine, grown in B.C. Bullets, and bare-root stock. Trees were planted both in a partial cut (shelterwood) and in the open. Survival, growth and the effects of ground competition are being monitored. Planting established in 1981 and 1982.

50) FIELD PERFORMANCE OF BLACK SPRUCE BARE-ROOT AND CONTAINERIZED OUTPLANTS

Investigators: N. Saltarelli and G. Stanclik

Affiliation: Abitibi-Price Inc.

Objective: A comparative study of the performance of outplanted black spruce bare-root, paperpot, and multipot stock. Plantings in 1981, 1982, and 1983, one site each year. Only the 1983 planting included all three stock types.

51) BRÄCKE SCARIFIER MOUNDING TRIAL

Investigators: R.F. Sutton and J.E. Wood

Affiliation: Canadian Forestry Service, Great Lakes Forest Research Centre

Objective: To compare the field performance of outplanted jack pine grown in FH 408 paperpots with that of 2+0 bare-root stock. Seedlings to be planted at two locations on two volumes (10 L and 20 L) of pimple- and dimple-shaped mineral mounds, created in 1983, located both within Brãcke scarified patches and on patch mini-mounds, with and without chemical weed control. Work in cooperation with the Algoma Central Railway, Sault Ste. Marie, Ontario. Planting is to be carried out in 1984.

52) CONTAINER STOCK PERFORMANCE ASSESSMENT

Investigator: K. Virgo

Affiliation: Spruce Falls Power and Paper Company, Limited

55) CONTAINER PLANTING MACHINE (ONE-SHOT)

Investigator: J.F. Flowers

Affiliation: Lakehead University

Objective: The development of a prototype two-row, intermittent, dibble-type planter for soft-walled, hard-walled and plug-type containers. Completed and tested in September 1982. The unit was field tested three times in the summer of 1983. An operational unit is planned for 1984.

56) DEVELOPMENT OF A CONTAINER PLANTING MACHINE FOR USE IN SWAMPLANDS (STAGE I) (VP-F-89)

Investigator: E. Stjernberg

Affiliation: Forest Engineering Research Institute of Canada

Scientific Representative: B.J. Sutherland

Affiliation: Canadian Forestry Service, Great Lakes Forest Research Centre

Objective: The objective of this, the first stage of a four-stage development plan, is to develop the proposed concepts to the point at which an experimental planting machine can be built and tested. Work on the first stage to be completed by mid-March 1984.

57) PNEUMATIC PLANTING OF FROZEN SEEDLINGS

Investigator: E.B. Thompson

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Objective: To develop a means of rapid planting for frozen seedlings whose root base is a solid bullet-shaped frozen mass which, when blown through an internally rifled tube, is spun-driven into the earth, where the plug will thaw and the tree resume growth.

APPENDICES

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